

CLAIMS

What is claimed:

1. An electronically programmable multimode circuit comprising:
 - a first port;
 - a second port;
 - a first path coupled between a first path port and said second port, said first path including
 - 5 a first phase shift device coupled to a first FET gate array;
 - a second path coupled between a second path port and said second port, said second path including a second phase shift device coupled to a second FET gate array;
 - a phase shift coupler coupled between said first port, said first path port, and said second path port; and
 - 10 said first and second FET gate arrays and said first and said second phase shift devices are electronically programmable and re-programmable by a user to select at least one mode.
2. An electronically programmable multimode circuit in accordance with Claim 1, wherein said phase shift coupler resolves a signal from the first port into a first vector component and a second vector component which are in phase quadrature, wherein said first vector component couples to said first path port and said second vector component couples to said second path
- 5 port.
3. An electronically programmable multimode circuit in accordance with Claim 1, wherein said electronically programmable multimode circuit may be cascaded with at least one other electronically programmable multimode circuit to form an electronic module having a least one of a plurality of modes consisting of: a multiplier, a mixer, an attenuator, a phase shifter, and
- 5 an In-Phase and Quadrature (IQ) modulator.
4. An electronically programmable multimode circuit in accordance with Claim 1, wherein said first phase shift device is a first Lange Coupler and said second phase shift device is a second Lange Coupler.
5. An electronically programmable multimode circuit in accordance with Claim 1, wherein each of said first and second FET gate arrays are dualgate FET arrays whereby each dualgate FET of the array includes a first gate terminal, a second gate terminal, a source terminal, and a drain terminal.

6. An electronically programmable multimode circuit in accordance with Claim 5, wherein said first and second FET gate arrays comprise dualgate FETs, said dualgate FETs have said first gate terminals electrically connected together, said drain terminals electrically connected together, and said source terminals electrically connected together.

7. An electronically programmable multimode circuit in accordance with Claim 5, wherein each said dualgate FET is electronically programmable and re-programmable by a separate electronic control signal coupled with each said second gate terminal to turn-on or to turn-off dualgate current flow providing signal adjustment.

8. An electronically programmable multimode circuit in accordance with Claim 5, wherein each said dualgate FET is electronically programmable and re-programmable to a mixer mode wherein a local oscillator signal is coupled to each said second gate terminal.

9. An electronically programmable multimode circuit in accordance with Claim 1, wherein said at least one mode is selected from a group consisting of a multiplier, a mixer, a switched attenuator, a phase shifter, and an In-Phase and Quadrature (IQ) modulator.

10. An electronically programmable multimode circuit in accordance with Claim 1, wherein said electronic programmability and re-programmability is controlled by at least one input digital word.

11. A reconfigurable phased array system comprising:

at least one radiating element;

at least one electronically programmable Monolithic Microwave Integrated Circuits (MMICs);

wherein said electronically programmable MMIC comprises:

a first port;

a second port;

a first path coupled between a first path port and said second port, said first path including a first phase shift device coupled to a first FET dualgate array;

a second path coupled between a second path port and said second port, said second path including a second phase shift device coupled to a second FET dualgate array;

a phase shift coupler coupled to said first port, said first path port, and said second path

port; and a phase shift coupler coupled to said first port, said first path port, and said second path port; and

15 said first and said second FET dualgate arrays and said first and said second phase shift device are electronically programmable and re-programmable by a user to choose one of a plurality of modes;

 wherein each said at least one electronically programmable MMIC second port is electrically coupled to said at least one radiating element.

12. A reconfigurable phased array in accordance with Claim 11, wherein said phase shift coupler resolves a signal from the first port into a first vector component and a second vector component that are in phase quadrature, wherein said first vector component couples to said first path port and said second vector component couples to said second path port.

13. A reconfigurable phased array in accordance with Claim 11, wherein said at least one electronically programmable MMIC first port may be electrically connected with a second electronically programmable MMIC second port to form an electronic module whereby said electronic module is electronically programmable and re-programmable to at least one mode
5 consisting of a multiplier, a mixer, an attenuator, a phase shifter, and an In-Phase and Quadrature (IQ) modulator.

14. A reconfigurable phased array system in accordance with Claim 11, wherein said first phase shift device is a first Lange coupler and second phase shift device is a second Lange coupler.

15. A reconfigurable phased array system in accordance with Claim 11, wherein said first and second plurality of dualgate FETs are three dualgate FETs.

16. A reconfigurable phased array system in accordance with Claim 11, wherein said dualgate FETs are individually electronically programmed and re-programmed off and on to provide dc power savings.

17. A reconfigurable phased array system in accordance with Claim 11, wherein said at least one mode is selected from a group consisting of a multiplier, a mixer, a switched attenuator, a phase shifter, and an In-Phase and Quadrature (IQ) modulator.

18. A transceiver circuit comprising:

a first electronically programmable multimode circuit for an In-Phase and Quadrature Phase (IQ) mode; said first circuit electrically connects first port to a second port;

5 a second electronically programmable multimode circuit for a mixer mode; said second circuit electrically connects said second port to a third port;

a third electronically programmable multimode circuit for a phase shifter mode; said third circuit electrically connects said third port to a fourth port;

each said first, said second, and said third electronically programmable multimode circuits including:

10 a plurality of modes;

a signal port;

a path port;

said plurality of modes consisting of a multiplier, a mixer, a phase shifter, an amplifier, an attenuator, and an IQ modulator mode;

15 a first path having an first path input port and a path port; said first path is electronically programmable and re-programmable controlling signal phase and amplitude adjustment;

20 a second path having an second signal input port and said path port; said second path is electronically programmable and re-programmable controlling signal phase and amplitude adjustment; and

a quadrature phase shift coupler electrically connecting said first path input port and said second path input port with said signal port.

19. A reconfigurable transceiver circuit in accordance with Claim 18, further comprising a fourth electronically programmable multimode circuit for an amplifier mode; said fourth electronically programmable multimode circuit electrically connects said fourth port to a fifth port.